EUB

Celtic Exploration Ltd.
Well Servicing Incident: Blowout and Fire
August 9, 2005

EUB Post-Incident Report

February 6, 2006

Alberta Energy and Utilities Board

ALBERTA ENERGY AND UTILITIES BOARD

EUB Post-Incident Report: Celtic Exploration Ltd. Well Servicing Incident—Blowout and Fire, August 9, 2005

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Published by

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Incident Overview

On Tuesday, August 9, 2005, at about 4:50 p.m., Celtic Exploration Ltd. (Celtic) notified the Alberta Energy and Utilities Board (EUB) of a sour oil well blowout and subsequent fire about 2.8 kilometres (km) southeast of the Town of Brooks. At the time of the incident, a service rig was on site undertaking a routine well completion operation.

The EUB's Medicine Hat Field Centre responded, and EUB personnel from the Medicine Hat Field Centre were on site during the remaining duration of the incident. Senior management from the EUB attended the site as well and provided assistance by facilitating the coordination of the Alberta Government Upstream Petroleum Incident Support Plan.

Celtic assessed the incident as an uncontrollable event and implemented its Corporate Emergency Response Plan (ERP). It also called in third-party well control experts from Key Safety and Boots & Coots. The RCMP and Brooks Fire Department responded and established roadblocks.

The RCMP and Celtic implemented an evacuation of the area. A total of 21 residents were evacuated. Of these, about 4 to 6 of the residents were requested to leave their home or business. Two people left voluntarily. The balance were people who were not at home when the evacuation started but were prevented from returning home by the roadblocks. Additionally, about 100 campers from the Tillebrook Provincial Park were evacuated by request.

The release concentration of hydrogen sulphide (H_2S) from the well was 4.5 moles/kilomole, or 0.45 per cent. Off-site air monitoring for H_2S and sulphur dioxide (SO_2) during the incident was provided by Alberta Environment, the EUB, and a third-party contractor.

At about 2:40 p.m. on August 10, 2005, the well was brought under control by pumping calcium chloride water down the well.

Subsequently, the evacuees were allowed to return to their residences and the campground.

One fatality and two injuries were sustained by workers at the site when the incident occurred. The fire destroyed the service rig.

EUB Investigation and Findings

The EUB conducted an investigation focused on the cause of the incident, the risk to public safety, environmental impacts, and the conservation of the resource. Alberta Human Resources and Employment, Workplace Health and Safety, is investigating the worker fatality and the worker injuries, pursuant to Occupational Health and Safety legislation.

The following findings resulted from the EUB investigation:

Cause

The blowout and fire resulted from an explosion within the swab tree assembly located at the top of the well. More specifically, an explosive environment that had been created through a mixing of hydrocarbons and air was ignited, but the source of the ignition could

not be definitively determined. The lubricator assembly had not been purged of air, nor was the pressure equalized with the tubing string prior to opening a valve on the assembly. The explosion occurred at the time the valve was opened and resulted in extremely high, localized internal pressures, causing failure of a flow tee and associated pipe fittings that were part of the swab tree assembly. The failure caused a fire and an uncontrolled flow of sour natural gas and oil.

Public Safety/Emergency Response

This portion of the investigation was to assess the implementation of Celtic's corporate ERP and the action undertaken to manage the incident.

The EUB concluded that at no time during the response to the incident was public safety at risk.

While many critical portions of Celtic's ERP were implemented and managed appropriately, the EUB has concluded that specific elements of Celtic's ERP were deficient. These deficiencies relate primarily to effective communication during an incident, especially with other affected stakeholders during the initial period of the incident. Specifically, there is a need to

- improve public and media notification regarding an incident's status;
- ensure that pertinent details are communicated in a timely manner to all affected parties, and
- ensure that on-site personnel are made available to manage logistics and information flow.

Celtic and the RCMP requested the evacuation of the residents and campers as a precautionary measure, but it was not necessary under EUB requirements. The emergency planning zone (EPZ) for this well was 40 metres (m). The nearest residence is 0.35 km, or 350 m, from the well, and the Tillebrook campground is about 0.7 km, or 700 m, from the well. The residents and campers were evacuated even though they were a considerable distance outside the 40 m EPZ.

Roadblocks established by the RCMP and Brooks Fire Department served to secure a perimeter around the site of the incident in order to restrict public access and enable access by the well control personnel.

The off-site air monitoring did not detect any H_2S or SO_2 readings in excess of the Alberta Ambient Air Quality Objectives. The one-hour average Alberta Ambient Air Quality Objective for H_2S is 10 parts per billion (ppb). The same objective for SO_2 is 170 ppb. The H_2S objective is set primarily for odour annoyance purposes and not for notification or evacuation purposes. H_2S can be smelled in concentrations of 1 to 30 ppb. The H_2S eight-hour occupational exposure level for worker safety in Alberta is 10 000 ppb. The highest instantaneous peak H_2S reading detected was 152 ppb. The highest one-hour average H_2S reading attributable to the well blowout was 4 ppb. There were no recorded off-site SO_2 readings attributable to the incident.

Environmental Impact

There was some oil spray on the well lease, and about 228 cubic metres (m^3) of contaminated soil was removed from the lease and taken to the Newell Regional Solid Waste site. This soil contained a concentration of about 5 to 10 per cent hydrocarbons.

Resource Conservation

The total production loss is estimated at 4 m^3 of oil and 12 000 m^3 of raw solution gas.

Follow-up Actions

Celtic

As a result of the incident and the EUB investigation, Celtic has committed to

1) re-evaluate its corporate ERP and revise it as necessary—Celtic will conduct an ERP exercise of its revised corporate ERP and the EUB will monitor the exercise;

2) conduct annual exercises of its corporate ERP with field personnel in all operating fields—Celtic's drilling and servicing personnel, including Celtic employees, consultants, and contractors, will also be required to attend these annual exercises;

3) develop and implement safe operating procedures for all drilling and servicing operations—those procedures will be reviewed at internal company safety meetings and annually to determine effectiveness; and

4) inform the industry of this incident to help prevent another occurrence by
   - sharing information with the Canadian Association of Petroleum Producers (CAPP),
   - completing a case study to be used in well servicing training programs, and
   - issuing a safety bulletin to industry.

EUB

1) The EUB will continue to support the Drilling and Completions Committee (DACC) in the completion of Industry Recommended Practice (IRP) 18, which deals with the prevention of explosions during drilling, completions, production, and other operations. Upon completion of IRP 18, the EUB anticipates adopting or citing the final IRP in a revision of *Directive 037: Service Rig Inspection Manual* (available on the EUB Web site at www.eub.gov.ab.ca/BBS/requirements/directives/directive037.htm).

2) The EUB will immediately issue *Directive 033: Well Servicing and Completions Operations—Interim Requirements Regarding the Potential for Explosive Mixtures and Ignition in Wells,* requiring operators undertaking completion or well servicing operations to document and implement practices to safely manage the potential for explosive mixtures and ignition in wells. This directive will take effect immediately and remain in force until new requirements can be written into the revision of *Directive 037.* A copy of *Directive 033* is attached and is available on the EUB Web site at www.eub.gov.ab.ca/BBS/requirements/directives/default.htm.

EUB Alberta Energy and Utilities Board

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Directive 033

February 6, 2006

Well Servicing and Completions Operations—Interim Requirement Regarding the Potential for Explosive Mixtures and Ignition in Wells

The Alberta Energy and Utilities Board (EUB/Board) has approved this directive on February 6, 2006.

<original signed by>

M. N. McCrank, Q.C., P.Eng.
Chairman

Interim Requirement

Licensees must recognize the inherent risks associated with well servicing and completions operations where there is potential for explosive mixtures and ignition in wells. Licensees must document and implement the necessary practices to safely manage the potential for explosive mixtures and ignition as part of their overall well control, blowout prevention, and crew training procedures.

The following interim requirement is effective immediately:

Licensees must

- have documented practices available at the well site for the safe management of the potential for explosive mixtures and ignition in wells and associated surface equipment, and
- ensure that all well site staff responsible for well control and blowout prevention understand these practices and know how to apply them.

This interim requirement expands upon existing EUB requirements for well control, blowout prevention, and crew training procedures to include an additional new requirement for addressing the potential for explosive mixtures and ignition in wells.

Compliance Assurance—Enforcement

Commencing April 1, 2006, EUB field representatives conducting well servicing and completions inspections and post-incident investigations will begin assessing compliance with this interim requirement. They will require the documented practices to be produced and will further interview the appropriate well site staff to verify their knowledge and use of the practices.

Failure to comply with this interim requirement will result in High Risk enforcement action.

Background

This serious safety issue is highlighted by the following recent incident. During a routine completion of an oil well, a blowout and subsequent fire resulted from an explosion within the swab tree assembly located on the top of the well. A review of the incident revealed that an explosive environment was created through a mixture of hydrocarbons and air. The explosion occurred when this mixture ignited, resulting in a failure of the piping and the subsequent well blowout and fire.

The lubricator assembly had not been purged of air, nor was the pressure equalized with the tubing string prior to opening a valve on the assembly. When the valve was opened, the explosion occurred. This explosion resulted in extremely high localized internal pressures, causing failure of a flow tee and associated pipe fittings that were part of the swab tree assembly. The failure caused a fire and uncontrolled flow of sour natural gas and oil. The service rig was destroyed. There was one fatality, and two other workers sustained injuries.

The EUB investigated this incident and concluded that new regulatory requirements regarding procedures for work of this nature needed to be developed and incorporated into future revisions of EUB *Directive 037: Service Rig Inspection Manual*. The EUB has previously issued *Safety Bulletins 2003-02 and 2005-02* for similar incidents. These safety bulletins can be viewed on the EUB's Web site at www.eub.gov.ab.ca/BBS/requirements/safetybulletins/default.htm.

Industry is presently developing an Industry Recommended Practice (IRP) to address the concern. Licensees should review the draft *IRP Volume 18: Explosive Atmospheres in Vessels, Tanks, and Piping System*, prepared by a Drilling and Completions Committee (DACC) subcommittee and available on the Web at www.psc.ca/irp_summary/irpvol_18.htm. The objective of IRP 18 is to develop recommended practices that will help operators and contractors work safely in situations where air and hydrocarbon mixtures are present. Further to this, the DACC IRP 18 subcommittee has launched a Web site at www.firesandexplosions.ca/, which provides information and management strategies regarding fires and explosions in the upstream oil and gas industry.

The EUB is very concerned about the current frequency and unacceptable consequences of such incidents and anticipates adopting and/or citing the final IRP 18 within the revised EUB *Directive 037*. Meanwhile, the EUB is instituting the interim requirement stated in Section 1.

Contact

Questions regarding this interim requirement should be directed to the EUB Field Surveillance Branch, Drilling and Servicing Technical Specialist: telephone (780) 460-3809, fax (780) 460-3802.

Questions regarding IRP 18 should be directed to the EUB Well Operations Section: telephone (403) 297-5290, fax (403) 297-2691, or e-mail eub.welloperations@gov.ab.ca.